

U.S.S.N. 10,804,713

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Claim Amendments

Please amend claims 1, 6, 10, 11, 13, 22, 24, and 28 as follows:

Please cancel claims 9 and 14-20 as follows:

Please add new claims 29-34 as follows:

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Claims as Amended

1. (currently amended) A semiconductor device fuse structure to prevent dielectric layer cracking at corner portions of associated metallization structures comprising:

a substrate;

a top inter-metal dielectric layer on said substrate;

at least two top metal lines comprising copper in said top inter-metal dielectric layer, each of said at least two top metal lines comprising a topmost metal layer in electrical communication with underlying copper interconnect structures extending through a plurality inter-metal dielectric layers;

a fuse comprising aluminum on said top inter-metal dielectric layer, said fuse providing electrical communication between said at least two top metal lines by spanning a distance between said at least two top metal lines;

a ~~protective layer~~ plurality of dielectric layers comprising a lowermost passivation layer on said fuse; and

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a window formed through a thickness portion of the ~~protective layer~~ plurality of dielectric layers to said lowermost passivation layer, said window positioned over a top portion of said fuse.

2. (original) A semiconductor device according to claim 1, wherein said ~~protective~~ passivation layer on said fuse comprises a dielectric layer.

3. (original) A semiconductor device according to claim 2, wherein said dielectric layer comprises silicon dioxide.

4. cancelled.

5. cancelled.

6. (currently amended) A semiconductor device fuse structure to prevent low-k dielectric material layer cracking at corner portions of associated metallization structures comprising:

two separated and respectively interconnected metallization structures, each of said metallization structures comprising

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copper and extending through a plurality of low-k dielectric material inter-metal dielectric layers;

wherein a fuse comprising aluminum extends between and electrically interconnects metal lines comprising each of the metallization structures in an ~~uppermost~~ inter-metal dielectric layer; and,

a window is disposed over a top portion of said fuse, said window extending through a thickness portion of a dielectric layer to a silicon dioxide layer on said fuse.

7. cancelled

8. cancelled

9. cancelled

10. (currently amended) The semiconductor device as set forth in claim [[9]] 6 further comprising an etch stop layer on an upper main face and a lower main face of the ~~uppermost~~ inter-metal dielectric layer.

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11. (currently amended) The semiconductor device as set forth in claim [[9]] 6 further comprising a plug extending between the metal lines and an underlying metallization layer ~~first metal layer and the topmost metal layer of the structure.~~

12. (original) The semiconductor device as set forth in claim 6 wherein the aluminum fuse has a thickness ranging from 1000-7000 angstroms.

13. (currently amended) The semiconductor device as set forth in claim [[9]] 6 wherein the ~~topmost metal layer of~~ metal lines of the metallization structures ~~has~~ have a thickness of at least 8000 angstroms.

Claims 14-20 (canceled)

21. (canceled)

22. (currently amended) A method of blowing the fuse structure of claim 1, comprising:

directing a laser beam at the fuse window onto the fuse using a wavelength ranging from 300-500 or 1000-1400 nm through

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the ~~protective~~ passivation layer.

23. (previously presented) The method as set forth in claim 22 wherein the passivation layer is disposed on an upper face of the fuse.

24. (currently amended) The method as set forth in claim 23 wherein the fuse passivation layer comprises silicon dioxide.

25. (previously presented) The method as set forth in claim 22 wherein an upper face of the fuse comprises aluminum.

26. cancelled

27. cancelled

28. (currently amended) A method of blowing a fuse structure to prevent low-k dielectric material layer cracking at corner portions of associated metallization structures, said fuse structure comprising:

a fuse window formed through at least one dielectric layer overlying an upper face of an aluminum fuse to expose a

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passivation layer comprising silicon dioxide on said fuse, said fuse window selectively disposed over said upper face of said aluminum fuse;

said aluminum fuse spanning a distance between two copper metallization lines ~~structures~~, each of said copper metallization lines ~~structures~~ comprising interconnected damascene structures extending through a plurality of low dielectric material layers;

wherein said method comprises:

directing a laser beam onto said fuse through said exposed silicon dioxide passivation layer using a wavelength ranging from 300-500 or 1000-1400 nm.

29. (new) The method of claim 28, wherein said damascene structures comprise dual damascene structures.

30. (new) The method of claim 28, wherein the two copper metallization lines have a thickness greater than the aluminum fuse.

31. (new) The semiconductor device according to claim 1, wherein

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each of said at least two top metal lines comprise a dual damascene structure.

32. (new) The semiconductor device according to claim 1, wherein the at least two top metal lines have a thickness greater than the aluminum fuse.

33. (new) The semiconductor device according to claim 6, wherein each of said metal lines comprises a dual damascene structure.

34. (new) The semiconductor device according to claim 6, wherein said metal lines have a thickness greater than the aluminum fuse.